

REMARKS

Claims 1-2, 4, and 6-14 are pending after entry of this paper. Claims 1-14 have been rejected. Claims 3 and 5 have been cancelled without prejudice, and the subject matter of both has been incorporated into claim 1.

Claims 1-2, 4, 6-8, and 10-14 have been amended. Support may be found throughout the instant specification and the claims as originally filed. For example, support for the amendments to claim 1 can be found at paragraphs 0015-0017 of the corresponding application publication (US 2006/0213332).

No new matter has been introduced by these amendments. Reconsideration and withdrawal of the pending rejections in view of the above claim amendments and below remarks are respectfully requested.

Response to Rejections under 35 U.S.C. §103

The Examiner has rejected claims 1 and 7 under 35 U.S.C. §103(a) for allegedly being obvious over U.S. Patent No. 4,252,775 (“Davister et al.”) in view of U.S. Patent No. 6,340,450 (“Fugleberg et al.”). The Examiner sets forth numerous alleged teachings of Davister et al. (pages 3-4 of the Office Action), several of which will be addressed below, and suggests that Davister et al. teaches each and every element of claim 1 (and claim 7) except for the teaching of “recovering zinc from a mixture of both zinc calcine and zinc sulphide concentrate.” The Examiner combines Fugleberg et al. with Davister et al. for allegedly teaching that both zinc sulphide concentrate and zinc calcine can be used in a neutral leaching. The Examiner concludes that it would have been obvious to recover zinc in a three-stage countercurrent leaching process

as claimed. Regarding the use of both zinc calcine and zinc sulphide concentrate, the Examiner concludes that (page 5 of the Office Action):

Fugleberg [et al.] shows that both zinc calcine and zinc sulphide concentrate are used in zinc recovery and furthermore one would reasonable expect both reagents to be used as zinc roasting is inherently not 100% efficiency [*sic*] as thus at least some zinc will not be oxidized (also evidenced by the presence of ferrite).

Applicants do not agree that the invention as recited in claim 1 would have been obvious over Davister et al. in view of Fugleberg et al. Specifically, applicants assert that Davister et al. does not disclose each and every element of claim 1 notwithstanding recovering zinc from both zinc calcine and zinc sulphide concentrate (applicants set forth the specific deficient elements in detail below). Combination with Fugleberg et al. does not remedy these deficiencies. Accordingly, applicants respectfully submit that the cited references do not teach each and every element of claim 1, either alone or in combination.

Davister et al. discloses a method for recovering zinc from ferriferous zinc ores (i.e., roasted ore, calcine) (abstract and col. 3, lines 5-16). Davister et al. is primarily directed to the recovery of a lead-bearing byproduct (abstract and col. 2, lines 59-60). Davister et alS. discloses a multi-stage process, involving a primary leaching in a single “neutral” stage, a three-stage countercurrent secondary leaching, and a final jarosite precipitation stage (col. 3, lines 5-16 and col. 3, line 67 – col. 4, line 2). In the primary leaching stage (1A), roasted ore is leached using spent sulfuric acid from the electrowinning (*i.e.*, return acid) and also using recycled acid from the jarosite precipitation stage (col. 8, lines 26-37). The thickened slurry from this stage is then submitted to the first stage of the secondary leaching (2A), which is maintained at an acidity between 30 and 50 g/L H₂SO₄, and where the leaching solution is recycled solution from the

second stage of the secondary leaching (3A) (col. 9, lines 9-17). The solution resulting from this first stage 2A is sent to the jarosite precipitation stage (5A), where jarosite precipitation is effected by the addition of calcine (col. 9, lines 18-32). The slurry from stage 2A is sent to the second stage of the secondary leaching (3A), which is maintained at an acidity between 130 and 150 g/L H_2SO_4 , and where the leaching solution is both return acid from electrowinning and solution recycled from the third stage of the secondary leaching (4A) (col. 9, lines 33-44). The slurry from stage 3A is sent to the third stage of the secondary leaching (4A), which is maintained at an acidity between 200 and 300 g/L H_2SO_4 , and where the highly acidic leaching takes place using both fresh sulfuric acid and return acid from electrowinning (col. 9, lines 45-64). The product from this final leaching stage 4A is the lead-bearing byproduct, the primary objective of Davister et al. (col. 10, lines 6-10). Davister et al. is clear that the primary leaching and the jarosite precipitation are not conducted countercurrently; rather only the three-stage secondary leaching is conducted countercurrently.

In the first instance, amended claim 1 is directed to a method for recovering zinc in three countercurrent stages. Claim 1 sets forth that the three stages are a first neutral leaching stage, a combined second concentrate and jarosite precipitation stage, and a third leaching stage. In contrast, Davister et al. discloses a five-stage method for recovering zinc. Accordingly, Davister et al. simply put does not disclose a three-stage countercurrent method for recovering zinc.¹

Furthermore, Davister et al. specifically teaches that each of the five stages disclosed are required, and as such teaches away from a process with less than five stages (See

¹ Furthermore, combination with Fugleberg et al., which discloses a two-stage method for recovering zinc, would also not result in a three-stage method for recovering zinc as claimed.

col. 5, lines 1-4, where is stated “industrial experimentation had shown that a secondary leaching in two stages [i.e., four total stages] was positively inadequate”).

Assuming *arguendo* that Davister et al. allows for any less than five stages, nevertheless Davister et al. does not teach each and every specific element of the three countercurrent stages recited in amended claim 1. The question becomes, which of the five stages of Davister et al. has the Examiner mapped onto the three stages of claim 1 in attempting to establish a *prima facie* case of obviousness? The Examiner has not clearly set forth this rationale, and has further improperly meshed and obfuscated the five separate and distinct stages of Davister et al. in an attempt to establish a *prima facie* case of obviousness.

First, the Examiner refers to the neutral leach of Davister et al. (the primary leaching stage 1A) and the use of return acid therein (page 4 of the Office Action). This leads to the assumption that the Examiner is equating the primary leaching stage of Davister with the first neutral leaching stage of claim 1. Thereafter, the Examiner refers to the leachate from this stage being further leached in three countercurrent stages, and specifically recites that “[i]n the second countercurrent leaching stage, jarosite is precipitated and separated is [*sic*] accordance to known techniques” (*Id.*). This begets to the conclusion that the Examiner is equating the second countercurrent leaching stage (3A) of Davister et al. with the second concentrate leaching and jarosite precipitation stage recited in claim 1. The Examiner goes on to refer to the acid concentration increasing from the first to the third stage, suggesting that the Examiner is equating the three countercurrent leaching stages of Davister et al. (2A, 3A, and 4A) with the three stages of claim 1. This, however, contradicts the Examiner’s first suggestion, that the primary neutral leaching stage (1A) of Davister et al. is equivalent to the first leaching stage recited in claim 1. Thus, the Examiner appears to be interpreting Davister et al. at once in two

distinct and contrary manners. Applicants nevertheless give the Examiner the benefit of the doubt, and rebut the Examiner's inconsistent contentions by showing either that Davister et al. does not teach the particular claim elements or that the Examiner has either misstated the factual teachings of Davister et al..

Regarding the first neutral leaching stage of claim 1, the Examiner has mapped either the primary neutral leaching stage (1A) or the first [of three] countercurrent leaching stages (2A) of Davister et al. Stage 1A of Davister et al. does not meet all the claim elements of the first neutral leaching stage in claim 1 because stage 1A leaching is not carried out with solution conducted from the second leaching stage (assuming the second leaching stage is considered either 2A or 3A). In the alternative, stage 2A leaching does not meet all the claim elements of the first neutral leaching stage in claim 1 because a) zinc calcine is not fed to stage 2A; and b) because stage 2A is not a "neutral" leach, but is instead performed at an acidity maintained in the range of 30 to 50 g/L. Thus, under either interpretation, Davister et al. does not teach each and every element of the first neutral leaching stage as claimed.

Regarding the second concentrate leaching and jarosite precipitation stage, the Examiner states that "[i]n the second countercurrent leaching stage [of Davister et al.], jarosite is precipitated and separated is [sic] accordance with known techniques." This contention, however, is not true. Davister et al., as described above, teaches a second countercurrent leaching stage (3A), and a separate and distinct jarosite precipitation stage (5A), into which is fed the solution coming from stage 3A. Davister et al. is thus clear that the jarosite precipitation occurs in stage separate and distinct from any leaching. In contrast, claim 1 recites a second stage with simultaneous concentrate leaching and jarosite precipitation. Stage 3A specifically does not meet all the claim elements of second stage of claim 1 because iron contained in the raw

materials is not precipitated as jarosite. Stage 5A specifically does not meet all the claim elements of second stage of claim 1 because a) the substrate is not “solids obtained from the first leaching stage;” and b) the leaching is not carried out using a solution conducted from the third leaching stage (stage 3A or 4A). Furthermore, neither stage 3A nor stage 5A are maintained at an acid content of about 2-20 g/L H₂SO₄, as required by amended claim 1. Thus, under either interpretation, Davister et al. does not teach each and every element of the second concentrate and jarosite precipitation stage as claimed in claim 1.²

For at least the foregoing reasons, applicants respectfully assert that under any interpretation of Davister et al., Davister et al. does not disclose each and every element of claim 1 notwithstanding recovering zinc from both zinc calcine and zinc sulphide concentrate. Furthermore, Fugleberg et al. does not remedy these deficiencies.

Fugleberg et al. is described in detail in the instant specification (paragraphs 0007-0008, and 0011-0012 of the corresponding publication). Although Fugleberg et al. does disclose a method for recovering zinc using both zinc calcine and zinc sulphide concentrate as starting materials, Fugleberg et al. does not remedy the deficiencies of Davister et al. set forth above. For example, Fugleberg et al. discloses a two-stage method, as opposed to the three-stage method recited in claim 1. Furthermore, there is no disclosure in Fugleberg et al. of the third stage recited in claim 1, wherein solids are leached with return acid after jarosite precipitation. For at least the foregoing reasons, applicants respectfully submit that each and every element of

² Applicants understand that the Examiner does not contend that Davister et al. teaches feeding zinc concentrate in this stage, and has applied Fugleberg et al. to remedy this deficiency.

claim 1 is not disclosed in the combination of Davister et al. and Fugleberg et al., and therefore no *prima facie* case of obviousness exists.³

For the foregoing reasons, applicants respectfully request reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. §103(a) over Davister et al. in view of Fugleberg et al. Applicants also request that the corresponding rejection of claim 7, which depends from claim 1, be withdrawn for the same reasons.

The Examiner has rejected claims 2-6 and 10-14 under 35 U.S.C. §103(a) for allegedly being obvious over Davister et al. in view of Fugleberg et al. as applied to claim 1, in further view of International Publication No. WO 02/46481 ("WO '481").

In the first instance, applicants respectfully submit that WO '481 remedies none of the deficiencies of the combination of Davister et al. and Fugleberg et al. as described above. Indeed, WO '481 is directed to an alternative method for recovering zinc from calcine having a two-stage neutral leaching, a strong acid leaching, a reduction of iron to soluble ferrous sulphate (which is recycled to the second neutral leach), and an iron precipitation stage (into which the solution from the second neutral leaching is fed).

³ As an additional point, applicants note that Fugleberg et al. also teaches away from the claimed invention. As mentioned in the instant specification (paragraph 0012 of the corresponding publication):

In the method described in [Fugleberg et al.], the conversion and concentrate leaching stage is performed at relatively high acid concentration. The resulting solution containing zinc sulphate is routed to neutral leaching, and because there is acid in the solution, it must be neutralized in the neutral leach stage. The higher the acid content of the solution, the higher the amount of iron in the solution also in general. As a result, the iron circulation in the process increases.

In contrast, the second concentrate leaching and jarosite precipitation stage of as recited in claim 1 is carried out at modest acidity, attenuating the need for neutralization to occur in the first neutral leaching stage. Furthermore, because of the more modest acidity in the second stage, there is less iron circulated to the first neutral leaching stage, which results in a zinc sulphate solution with a minimum amount of iron (see paragraph 0021 of the corresponding publication).

Regarding claim 2, the Examiner contends that WO '481 teaches that neutral leaching of zinc oxide occurs at pH 2-5. Applicants submit that claim 2, which depends from claim 1, is allowable for the reasons set forth above in reference to claim 1.

Regarding claims 3-6 (claims 3 and 5 have been incorporated into claim 1), the Examiner contends that it would have been obvious to choose the claimed ranges through process optimization, citing to WO '481 in support. Applicants respectfully disagree. WO '481, in contrast to the instant claims, relates to the precipitation of iron as jarosite from leached from zinc calcine, not zinc sulphide concentrate. Furthermore, claims 4 and 6, which depend from claim 1, are allowable for the reasons set forth above in reference to claim 1.

Regarding claims 10-12, the Examiner contends that Davister et al. "teaches the precipitation of jarosite in the concentrate leaching and jarosite precipitation stage" (page 7 of the Office Action. As set forth in detail above, this is factually incorrect, as Davister et al. teaches precipitation of jarosite in a stage separate from any leaching stage.

Regarding claims 13 and 14, applicants submit that they are allowable due to their dependence on claim 1, which is also allowable for the reasons set forth above.

For the foregoing reasons, applicants respectfully request reconsideration and withdrawal of the rejection of claims 2-6 and 10-14 under 35 U.S.C. §103(a) over Davister et al. in view of Fugleberg et al. in further view of WO '481.

The Examiner has rejected claims 8 and 9 under 35 U.S.C. §103(a) for allegedly being obvious over Davister et al. in view of Fugleberg et al. as applied to claims 1 and 7, in further view of U.S. Patent No. 4,124,462 ("Reinhardt et al.") in view of "Graf" (article entitled "Zinc," see page 7 of the Office Action for full citation). The Examiner applies Reinhardt et al.

and Graf for allegedly teaching the addition of oxygen/air to oxidize ferrous iron and precipitate it as hydroxide $\text{Fe}(\text{OH})_3$ which co-precipitates with harmful minerals such as Ge and Sb (page 8 of the Office Action). Regardless of whether this teaching is present in Reinhardt et al. and Graf, neither reference alone or in combination remedies the deficiencies in the combination of Davister et al. and Fugleberg et al. as outlined above.

Reinhardt et al. is directed to a method for recovering zinc from steel mill dust containing zinc and iron in one (neutral) leaching stage, and also discloses further solution purification and liquid-liquid extractions stages. It is understood that such dust does not contain ferrites or concentrate, and as such leaching can be effected under mild conditions where the iron can be simultaneously precipitated as hydroxide. In contrast to the invention as claimed, the precipitated iron is not further conducted to be leached and precipitated as jarosite.

Graf describes an alternative process for recovering zinc from zinc calcine, where the iron of the calcine is precipitated as iron hydroxide. In contrast, in invention as claimed, hydroxide precipitation is used to precipitate the iron and harmful minerals from the zinc sulphate solution and iron is leached again in the second stage to precipitate it as jarosite.

Applicants therefore submit that claims 8 and 9 are allowable for the same reasons as to why claim 1 is allowable. Applicants therefore respectfully request reconsideration and withdrawal of the rejections of claim 8 and 9 under 35 U.S.C. §103(a) over Davister et al. and Fugleberg et al. in view of Reinhardt et al. and Graf.

Dependent Claims

Applicants have not independently addressed all of the rejections of the dependent claims. Applicants submit that for at least similar reasons as to why independent claims 1 from which all of the dependent claims 2, 4, and 6-14 depend are believed allowable as discussed *supra*, the dependent claims are also allowable. Applicants however, reserve the right to address any individual rejections of the dependent claims and present independent bases for allowance for the dependent claims should such be necessary or appropriate.

Thus, applicants respectfully submit that the invention as recited in the claims as presented herein is allowable over the art of record, and respectfully request that the respective rejections be withdrawn.

CONCLUSION

Based on the foregoing amendments and remarks, applicants respectfully request reconsideration and withdrawal of the rejection of claims and allowance of this application. Favorable action by the Examiner is earnestly solicited.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. **13-4500**, Order No. 4819-4748.

Applicants believe this paper to be timely filed. In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. **13-4500**, Order No. 4819-4748.

Respectfully submitted,
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